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Effects of Immersion Solutions on Characteristics and Consumer Preference of Cassava Rice

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Abstract*— Indonesia's rice consumption reached 139 kg / capita / year. This figure is still quite high compared to other countries in Asia, such as Japan (60 kg / capita / year). That condition indicated that consumption of carbohydrates in Indonesia is still dominated by rice, which reached 78%. Many efforts to decrease the consumption of rice are needed, and one of them is to optimize the utilization of cassava into cassava rice. This research was aimed to assess technologies in production process of cassava rice which applicable at farmer level and also can be accepted by consumers. This experiments used Completely Randomized Design with 5 replications. Treatments consists of various types of marinade solution, namely 1) sodium bicarbonate 2%, 2) metaphosphate 0.1%, 3) sodium bicarbonate + metaphosphate 2% + 0.1%, and 4) running water. The stages of production process were: sortation of rice cassava, cassava bark stripping, washing, soaking, draining, pressing, drying, and filtering. Parameter observations consist of moisture content, ash content, protein content, fat content, carbohydrate content. Organoleptic tests on rice cassava include color, taste, aroma, firmness, stickiness and eating palatability. The results showed that the moisture content of the rice cassava range 4.419% - 5.378%, ash content was 0.171% - 0.182%, protein content was 1.745% - 2.024%, fat content of 0.792% - 0.930%, and carbohohidrate level was 91.693% - 92.564%. Meanwhile, organoleptic tests showed that the treatment of type marinade gave significant effects on the color, flavor, aroma, suppleness and eating palability, except the level of stickiness. Soaking with sodium bicarbonate and metaphosphate causing cassava rice color became brighter and also gave higher valuation by panelists (5.8 = like). Moreover, panelists gave 5.2 points (like) on eating palability to sample with treated by immersion in tap water without the use of sodium bicarbonate and metaphospahate but not significantly different from soaking with sodium bicarbonate.

***Keywords:* Cassava Rice; Sodium Bicarbonate; Metaphosphate; Organoleptic Test.**

I. INTRODUCTION

Currently, Indonesia's rice consumption reached 139 kg / capita / year. This figure is still quite high compared to other countries in Asia, such as Japan (60 kg / capita / year). That condition indicated that consumption of carbohydrates in Indonesia is still dominated by rice, which reached 78%. Therefore, many efforts to decrease the consumption of rice are needed. One effort to reduce the level of rice consumption is to optimize the utilization of carbohydrate sources. One of food staples that has a great potential to replace the rice is cassava.

Cassava is a crop with a great potential to substitute rice in food diversification program because it is more efficient in generating energy, vitamins, and minerals than other food crops. In terms of nutrition, cassava is a good source of energy, vitamins, and high quality minerals (Horton et al., 1989). In addition, comparing with rice content, cassava is a fairly good source of nutrition, namely thiamin (0.09 mg), riboflavin (0.06 mg), niacin (0.6 mg), K (243 mg), P (47 mg), Fe (0.7 mg), and Ca (32 mg) compared with the nutrients contained in rice.

However, there were some problems that cassava were inferior and yet not attractively presented both raw and processed material to be optimally used as a substituter for rice. Besides that, the form and flavor of cassava are still not fully accepted by consumers as a staple food that can be eaten as rice analog. Therefore, efforts to process cassava into cassava rice are needed to be held. A technology innovation is required to obtain sufficient product approaching the physical properties and flavor of rice without reducing the nutritional value of cassava. In this case, this research was aimed to assess technologies in production process of cassava rice which applicable at farmer level and also can be accepted by consumers

II. MATERIALS AND METHODS

The study was conducted at laboratory of Jakarta Assesment Institute for Agricultural Technology and laboartory of Indonesian Center for Agricultural Post harvest Research and Development from July to November 2012.

The raw materials were cassava (*Manihot utilisima*), sodium bicarbonate, metaphosphate and other chemicals for product analysis. Processing tool consists of a grate machine, squeezer machine, oven, and a 80 mesh sieve. Experimental design used a completely randomized design with 4 treatments and 5 replications.

Treatment included:

1) immersion by using sodium bicarbonate,
2) immersion with metaphosphate,
3) soaking in a solution of sodium bicarbonate and metaphosphate, and
4) soaking in tap water. Stage of making of cassava rice (Rasi) included sorting, stripping the skin of cassava, washing, soaking, draining, grating, pressing, drying and sieving (Figure 1).

After the washing process then cassava drained and halved to remove the middle vein of cassava tubes. After that, cassava was soaked, washed and drained again. Then, it grated and pressed until the juice did not drip anymore. Meanwhile, as can be seen in Figure 2, stages of cooking of cassava rice start by steaming water mixing cassava rice and water (75 ml/100 g) before then steaming in medium heat for 10 minutes. Parameter observations consist of moisture content, ash content, protein content, fat content, carbohydrate content. Meanwhile, organoleptic tests on rice cassava include color, taste, aroma, firmness, stickiness and eating palatability.

Organoleptic tests carried out by semi-trained panelists with six scale hedonic, they were 6 (really like), 5 (like), 4 (somewhat like), 3 (netral), 2 (do not like), 1 (strongly dislike).

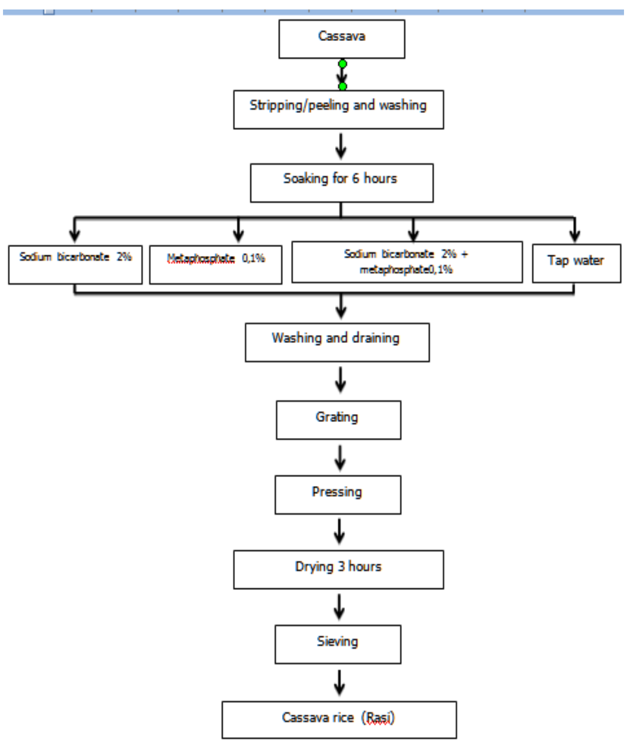

Figure 1. Cassava rice production

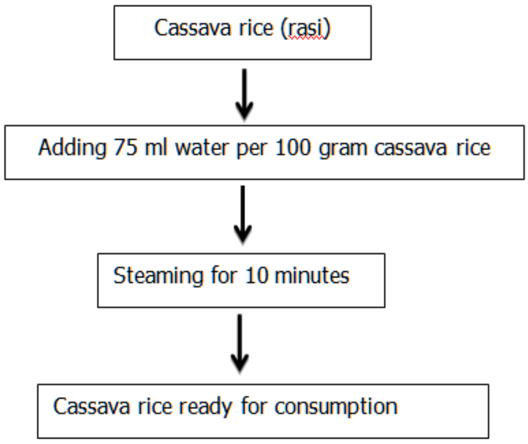

Figure 2. Cooking of cassava rice

III. RESULTS AND DISCUSSION

Cassava rice was made through some steps which every step affected yield of cassava rice production. As can be seen in Table 1, yield of cassava rice decreased after some process. Washing and stripping caused almost 20% losing, while pressing caused about 30% losing. So that, the yield of cassava rice production was 35.52%.

TABLE I
YIELD OF THE PROCESS OF CASSAVA RICE PRODUCTION

Processing stage	Output	Yield (%)
Washing and stripping/peeling	Peeled cassava	84,13
Pressing	Grated and pressed cassava	57,64
Drying	Cassava rice	35.52

Meanwhile, the chemical properties of cassava rice from proximate analysis showed that average moisture contents of caccava rice with various immersion solution were almost same for all treatment (Table 2). Based on statistical tests showed that each treatment was not significantly different to the moisture content of cassava rice. Highest water content obtained in immersion treatment with a combination of sodium bicarbonate and metaphosphate, it was 5.32% and without the marinade ingredients (tap water), it was 5, 37%. The lowest moisture content obtained in immersion treatment with only sodium bicarbonate and only metaphosphate, they were 4.42% and 4.98%, respectively. According to SNI 01-2997-1996, requirement of maximum moisture content for cassava flour is 12%, so that all soaking treated cassava rice have qualified as high quality cassava flour.

TABLE II
MOISTURE CONTENT OF CASSAVA RICE WITH VARIOUS IMMERSION SOLUTION

Treatments	Moisture content (%)
Sodium bicarbonate	4.4191
Metaphosphate	4.9809
Sodium bicarbonate + Metaphosphate	5.3240
Tap water	5.3784

As same as with moisture content, other parameters from proximate analysis showed that there was no significantly difference for all immersion solution treatments. As can be seen in Table 3, 4, 5, and 6, the ash content of cassava rice range 0.171% - 0.182%, while protein content was 1.745% - 2.024%, fat content of 0.792% - 0.930%, and carbohohidrate level was 91.693% - 92.564%.

TABLE III
ASH CONTENT OF CASSAVA RICE WITH VARIOUS IMMERSION SOLUTION

Treatments	Ash content (%)
Sodium bicarbonate	0.1820
Metaphosphate	0.1737
Sodium bicarbonate + Metaphosphate	0.1724
Tap water	0.1707

TABLE IV
PROTEIN CONTENT OF CASSAVA RICE WITH VARIOUS IMMERSION SOLUTION

Perlakuan	Protein content (%)
Sodium bicarbonate	1.9045
Metaphosphate	2.0244
Sodium bicarbonate + Metaphosphate	1.9660
Tap water	1.7450

TABLE V
FAT CONTENT OF CASSAVA RICE WITH VARIOUS IMMERSION SOLUTION

Treatments	Fat content (%)
Sodium bicarbonate	0.9300
Metaphosphate	0.8761
Sodium bicarbonate + Metaphosphate	0.8790
Tap water	0.7925

TABLE VI
CARBOHYDRATE CONTENT OF CASSAVA RICE WITH VARIOUS IMMERSION SOLUTION

Treatments	Carbohydrate content (%)
Sodium bicarbonate	92.5644
Metaphosphate	91.9450
Sodium bicarbonate + Metaphosphate	91.6928
Tap water	91.8995

In contrast with proximate tests, organoleptic tests showed that the treatment of type marinade (immersion solution) gave significant effects on color, flavor, aroma, suppleness and eating palability, except the level of stickiness. As can be seen in Table 7, soaking with sodium bicarbonate and metaphosphate causing cassava rice color became brighter and also gave higher valuation by panelists (5.8 = like). Moreover, panelists gave 5.2 points (like) on eating palability to sample with treated by immersion in tap water without the use of sodium bicarbonate and metaphospahate but not significantly different from soaking with sodium bicarbonate.

TABLE VII
ORGANOLEPTIC SCORE OF CASSAVA RICE WITH VARIOUS IMMERSIO COLUTION

Perlakuan	Warna	Rasa	Aroma	Kekeyalan	Tingkat kelengketan	Eating palatability
S	$4{,}5^{a}$	$4{,}5^{a}$	$4{,}4^{a}$	$4{,}6^{ac}$	$5{,}0^{a}$	$4{,}8^{ac}$
M	$4{,}9^{ac}$	$4{,}5^{a}$	$4{,}5^{ab}$	$4{,}5^{a}$	$5{,}0^{a}$	$4{,}4^{a}$
SM	$5{,}8^{b}$	$4{,}3^{a}$	$4{,}9^{bc}$	$3{,}6^{b}$	$5{,}1^{a}$	$2{,}5^{b}$
Tap water	$5{,}3^{c}$	$5{,}5^{b}$	$5{,}1^{c}$	$5{,}1^{c}$	$5{,}0^{a}$	$5{,}2^{c}$

Note: S = Sodium bicarbonate, M = Metaphosphate,

IV. CONCLUSIONS

Cassava rice was made through some steps which every step affected yield of cassava rice production. For, soaking (immersion) step in processing of cassava rice, it seem that the using of bicarbonate and metaphosphate were useless because they did not gave siginificantly different result with tap water on proximate parameters (moisture, ash, protein, fat and carbohydrate contents). However, sodium bicarbonate and metaphosphate gave significant difference on hedonic test result. Soaking with sodium bicarbonate and metaphosphate causing cassava rice color became brighter and also gave higher valuation by panelists (5.8 = like). Moreover, panelists gave 5.2 points (like) on eating palability to sample with treated by immersion in tap water without the use of sodium bicarbonate and metaphospahate but not significantly different from soaking with sodium bicarbonate.

REFERENCES

[1] Anonim. 2011. *Konsumsi Beras Penduduk Indonesia Masih Tinggi*. www.nextindonesia (9 Juni 2011).

[2] Horton, D., G. Prain, and P. Gregory.1989. High level invesment retuns for global sweet potato research and development Circular 17(3):1-11

[3] Khomsan, A, 2002. Pangan dan Gizi kesehatan. PT. Raja Grafindo Persada. Jakarta.

[4] Koeswara, S. 2003. Optimasi Teknologi Pengolahan Sweet Potatos Flakes. Laporan Akhir penelitian Rusnas Diversifikasi Pangan Pokok. Pusat Studi Pangan dan Gizi-IPB. Bogor

[5] Pratama, Agoung Gedhe. 2010. Mempelajari Pengaruh Konsentrasi Ragi Instan dan Waktu Fermentasi terhadap Pembuatan Alkohol dari Ampas Ubi Kayu (Manihot utilisima). Skripsi. Departemen Teknologi Pertanian, Fakultas Pertanian Universitas Sumatra Utara.

[6] Priantary, Anggita S. 2011. Kajian Pembuatan Flakes Berbahan Dasar Porang (Amor phophallus oncophiyllus) dan Kacang Hijau (Phaseolus radialus) sebagai Upaya Diversifikasi Pangan. www.wordpress.com (30 November 2011).

[7] Sarwono, B. 2007. Bertanan Ubi Jalar. Penebar Swadaya. Jakarta.

[8] Sentra IPTEK. 2007. Teknologi Tepat Guna Tanaman Penghasil Pati. Menteri Negara Riset dan Teknologi. Diakses dari http://www.iptek.net.id (2 Desember 2008)

[9] Saragih, B. 2011. 2030 Konsumsi Beras harus 60 kg.www.metronews.com (10 Januari 2012).

[10] Tamtarini dan Sih Yuwanti. 2005. *Pengaruh Penambahan Koro-Koroan terhadap Sifat Fisik dan Sensorik Flake Ubi Jalar* dalam Jurnal Teknologi Pertanian Vol. 6, No.2, Agustus 2005 ISSN 1411-5131 Hal. 143-211.

[11] Valentas, J.K., L. Levine, dan J.P. Clark. 1991. Food Processing Operation and Scale-up. Marcel Dekker Inc., Madison, New York